Claims Amendment

1. (currently amended) A method of forming bumps on a silicon wafer having an active surface with a passivation layer and a plurality of bonding pads thereon, wherein the passivation layer exposes the bonding pads, the method comprising the steps of:

forming an adhesion layer over the active surface of the wafer, wherein the adhesion layer covers both the bonding pads and the passivation layer;

forming a barrier layer over the adhesion layer;

forming a wettable layer over the barrier layer;

conducting a photolithographic process to form a plurality of photoresist blocks over the wettable layer;

conducting an etching operation to remove the wettable layer, the barrier layer and the adhesion layer outside the photoresist blocks so that only the wettable layer, the barrier layer and the adhesion layer underneath the photoresist blocks remain;

removing the photoresist blocks;

attaching a plurality of first solder blocks to the upper surface of the wettable layer through a bonding operation, wherein each first solder block has an upper surface and a lower surface such that the lower surface of the first solder block bonds with the wettable layer;

planarizing the upper surface of the first solder blocks;

attaching a second solder block to the upper surface of each first solder block through a bonding operation; and

~~conducting a reflow operation to attain a solder bump which is formed by~~ alloying the first solder block and the second solder block to attain a single solder bump.

2. (original) The method of claim 1, wherein material constituting the adhesion layer is selected from a group consisting of titanium, titanium-tungsten alloy, aluminum and chromium.

3. (original) The method of claim 1, wherein material constituting the barrier layer is selected from a group consisting of nickel-vanadium alloy, chromium-copper alloy and nickel.

4. (original) The method of claim 1, wherein material constituting the wettable layer is selected from a group consisting of copper, palladium and gold.

5. (currently amended) The method of claim 1, wherein each second solder block includes an upper surface and a lower surface, the lower surface is in contact with the upper surface of the first solder block, and the upper surface of the second solder block is planarized by polishing ~~followed by the reflow operation after the second solder block is bonded to the first solder block~~.

6. (previously amended) The method of claim 1, wherein material constituting the first solder blocks is selected from the group consisting of lead-tin alloy, lead-silver alloy, tin-silver alloy, silver and gold.

7. (previously amended) The method of claim 1, wherein material constituting the second solder blocks is selected from the group consisting of lead-tin alloy, tin-silver alloy, tin-silver-copper alloy and tin.

8. (original) The method of claim 1, wherein the step of planarizing the upper surface of the first solder blocks includes polishing.

9. (original) The method of claim 1, wherein the step of planarizing the upper surface of the first solder blocks includes applying a pressure.

10. (original) The method of claim 1, wherein the step of attaching a first solder block to the wettable layer includes the sub-steps of:

providing a conductive wire;

heating one end of the conductive wire so that the heated end of the conductive wire transforms into a spherical blob;

pulling the spherical blob towards the wettable layer and pressing the spherical blob against the surface of the wettable layer; and

detaching the remaining portion of the conductive wire from the spherical blob to form the first solder block.

11. (original) The method of claim 10, wherein the step of pressing the spherical blob against the wettable layer is further assisted by application of ultrasound.

12. (original) The method of claim 1, wherein the step of attaching a second solder block to a first solder block further includes the sub-steps of:

providing a conductive wire;

heating one end of the conductive wire so that the heated end of the conductive wire transforms into a spherical blob;

pulling the spherical blob towards the first solder block and pressing the spherical blob against the upper surface of the first solder block; and

detaching the remaining portion of the conductive wire from the spherical blob to form the second solder block.

13. (previously amended) The method of claim 12, wherein the step of pressing the spherical blob against the first solder block is further assisted by an application of ultrasound.

14. (currently amended) A method of forming bumps on an active surface of a silicon wafer, the method comprising the steps of:

forming an under-ball metallic layer over the active surface of the wafer, wherein the under-ball metallic layer is a composite layer;

removing a portion of the under-ball metallic layer to expose the active surface of the wafer;

attaching a plurality of first solder blocks to an upper surface of the under-ball metallic layer, wherein each first solder block has an upper surface and a lower surface such that the lower surface of each first solder block bonds with the under-ball metallic layer;

planarizing the upper surface of the first solder blocks;

attaching a second solder block to the upper surface of each first solder block; and

~~conducting a reflow operation to~~ transforming the first solder block and the second solder block into a single integral solder bump alloy, wherein the solder bump alloy has a

specified composition ratio of a material that constitutes the first solder block to a material that constitutes the second solder block.

15. (original) The method of claim 14, wherein the step of forming an under-ball metallic layer over the active surface of the wafer includes the sub-steps of:

forming an adhesion layer over the active surface of the wafer;

forming a barrier layer over the adhesion layer; and

forming a wettable layer over the barrier layer.

16. (original) The method of claim 15, wherein material constituting the adhesion layer is selected from a group consisting of titanium, titanium-tungsten alloy, aluminum and chromium.

17. (original) The method of claim 15, wherein material constituting the barrier layer is selected from a group consisting of nickel-vanadium alloy, chromium-copper alloy and nickel.

18. (original) The method of claim 15, wherein material constituting the wettable layer is selected from a group consisting of copper, palladium and gold.

19. (currently amended) The method of claim 14, wherein each second solder block includes an upper surface and a lower surface, the lower surface is in contact with the upper surface of the first solder block, and the upper surface of the second solder block is planarized by polishing ~~followed by the reflow operation after the second solder block is bonded to the first solder block~~.

20. (currently amended) The method of claim 14, wherein the material constituting the first solder blocks is selected from the group consisting of lead-tin alloy, lead-silver alloy, tin-silver alloy, silver and gold.

21. (previously amended) The method of claim 14, wherein the material constituting the second solder blocks is selected from the group consisting of lead-tin alloy, tin-silver alloy, tin-silver-copper alloy and tin.

22. (original) The method of claim 14, wherein the step of planarizing the upper surface of the first solder blocks includes polishing.

23. (original) The method of claim 14, wherein the step of planarizing the upper surface of the first solder blocks includes applying a pressure.

24. (original) The method of claim 14, wherein the step of attaching a first solder block to the under-ball metallic layer includes the sub-steps of:

providing a conductive wire;

heating one end of the conductive wire so that the heated end of the conductive wire transforms into a spherical blob;

pulling the spherical blob towards the under-ball metallic layer and pressing the spherical blob against the surface of the under-ball metallic layer; and

detaching the remaining portion of the conductive wire from the spherical blob to form the first solder block.

25. (original) The method of claim 24, wherein the step of pressing the spherical blob against the under-ball metallic layer is further assisted by application of ultrasound.

26. (original) The method of claim 14, wherein the step of attaching a second solder block to a first solder block further includes the sub-steps of:

providing a conductive wire;

heating one end of the conductive wire so that the heated end of the conductive wire transforms into a spherical blob;

pulling the spherical blob towards the first solder block and pressing the spherical blob against the upper surface of the first solder block; and

detaching the remaining portion of the conductive wire from the spherical blob to form the second solder block.

27. (original) The method of claim 26, wherein the step of pressing the spherical blob against the first solder block is further assisted by application of ultrasound.

28. (currently amended) A method of forming bumps on the active surface of a silicon wafer, wherein the active surface further includes an under-ball metallic layer thereon and the under-ball metallic layer is a composite layer that comprises a plurality of material layers, the method comprising the steps of:

attaching at least one first solder block to an upper surface of the under-ball metallic layer by conducting a bonding operation;

attaching at least one second solder block to the upper surface of the first solder block by conducting a bonding operation; and

~~integrating~~ alloying at least one of the first solder block and at least one of the second solder block into at least one ~~a~~ single solder bump ~~by performing a reflow operation~~.

29. (original) The method of claim 28, wherein after the step of attaching the first solder block to the upper surface of the under-ball metallic layer, further includes planarizing the upper surface of the first solder block and attaching a second solder block to the upper surface of the first solder block by conducting a bonding operation.

30. (original) The method of claim 29, wherein the step of planarizing the upper surface of the first solder block includes polishing.

31. (original) The method of claim 29, wherein the step of planarizing the upper surface of the first solder block include pressing.

32. (original) The method of claim 28, wherein after the step of attaching the second solder block to the upper surface of the first solder block, further includes planarizing the upper surface of the second solder block.

33. (original) The method of claim 32, wherein the step of planarizing the upper surface of the second solder blocks includes polishing.

34. (previously canceled)

35. (previously amended) The method of claim 28, wherein material constituting the first solder blocks is selected from the group consisting of lead-tin alloy, lead-silver alloy, tin-silver alloy, silver and gold.

36. (previously amended) The method of claim 28, wherein material constituting the second solder blocks is selected from the group consisting of lead-tin alloy, tin-silver alloy, tin-silver-copper alloy and tin.

37. (original) The method of claim 28, wherein the step of attaching a first solder block to the under-ball metallic layer includes the sub-steps of:

providing a conductive wire;

heating one end of the conductive wire so that the heated end of the conductive wire transforms into a spherical blob;

pulling the spherical blob towards the under-ball metallic layer and pressing the spherical blob against the surface of the under-ball metallic layer; and

detaching the remaining portion of the conductive wire from the spherical blob to form the first solder block.

38. (original) The method of claim 37, wherein the step of pressing the spherical blob against the under-ball metallic layer is further assisted by application of ultrasound.

39. (original) The method of claim 28, wherein the step of attaching a second solder block to a first solder block further includes the sub-steps of:

providing a conductive wire;

heating one end of the conductive wire so that the heated end of the conductive wire transforms into a spherical blob;

pulling the spherical blob towards the first solder block and pressing the spherical blob against the upper surface of the first solder block; and

detaching the remaining portion of the conductive wire from the spherical blob to form the second solder block.

40. (original) The method of claim 39, wherein the step of pressing the spherical blob against the first solder block is further assisted by application of ultrasound.

Claims 41-43 (currently amended)